

Joint Meeting of SARB and SOFA Working Groups

CERES Science Team Meeting

Norfolk, Virginia May 7, 2002

Surface and Atmosphere Radiation Budget (SARB)

Thomas P. Charlock

Surface-Only Flux Algorithms (SOFA)

David P. Kratz

David A. Rutan: “Comparison of Helicopter and SARB/CRS
Derived Surface Albedo at ARM SGP”

Fred G. Rose: “SARB CRS Aerosols”

T. P. Charlock: “Various SARB Issues in TRMM and Terra”

Various SARB Issues in TRMM and Terra by Thomas P. Charlock

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Should we issue call for SSF-CRS software making this?

One month subset covering 1% of domain
(i.e., the validation regions)

Include FSW and SYN when ready?

*Example of application: Run with various AOT
inputs; compare with Cimel & CAVE; then select.*

Over 30 ARM, BSRN, and SURFRAD sites (Jan.-Aug. 1998).

Untuned mean bias and rms for TOA only at all CAVE sites in parentheses using italic font.

Tuned insolation comparison at ARM SGP Central Facility (one site) in red.

	Observed Mean	N	Bias Obs- SARB	RMS
ALL SKY	Wm-2	sample	Wm-2	Wm-2
LW Down SFC	358	8405	3	20
LW Up SFC	429	7031	3	20
SW Down SFC	439 428	4725 260	-31 -21	82 60
SW Up SFC	89	4308	11	25
LW Up TOA	253	9071	1 (1)	5 (8)
SW Up TOA	221	4962	1 (7)	19 (27)

OVERCAST VIRS

SW Down SFC	241 243	1176 68	-25 -27	81 87
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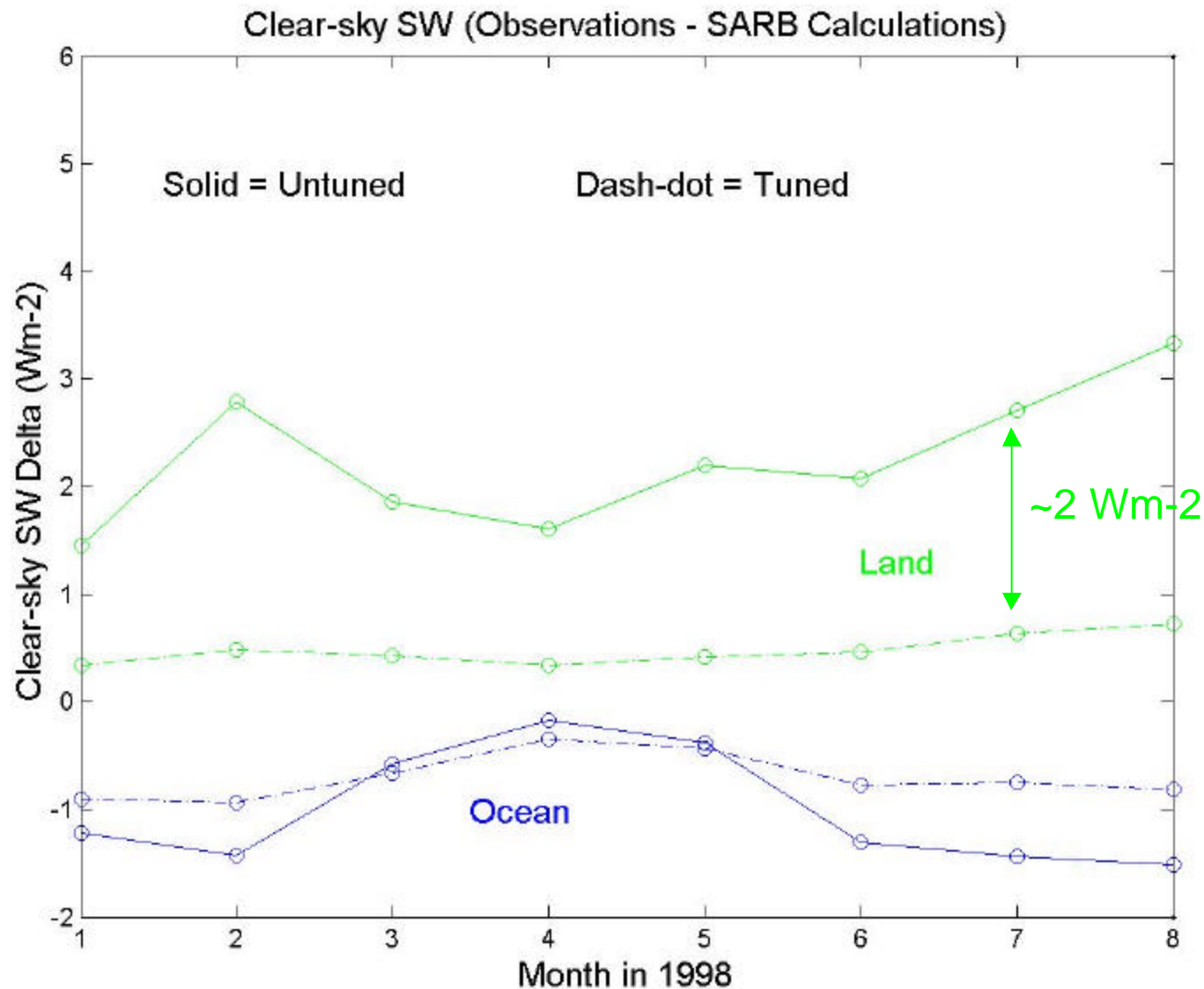
CLEAR VIRS

SW Down SFC	519 512	1534 94	-32 -23	49 29
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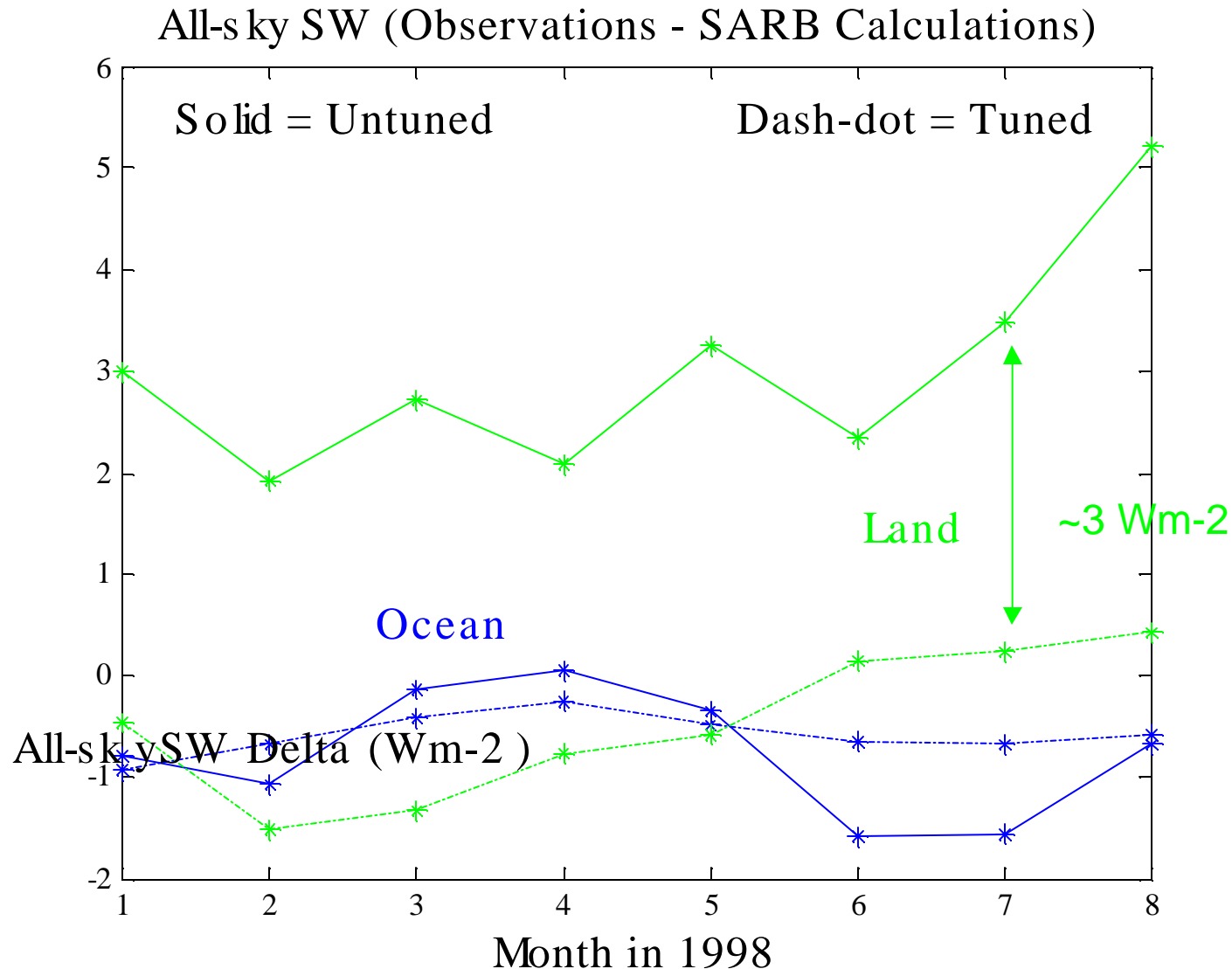
CLEAR VIRS + PSP

SW Down SFC	486 324	202 17	-22 -14	27 17
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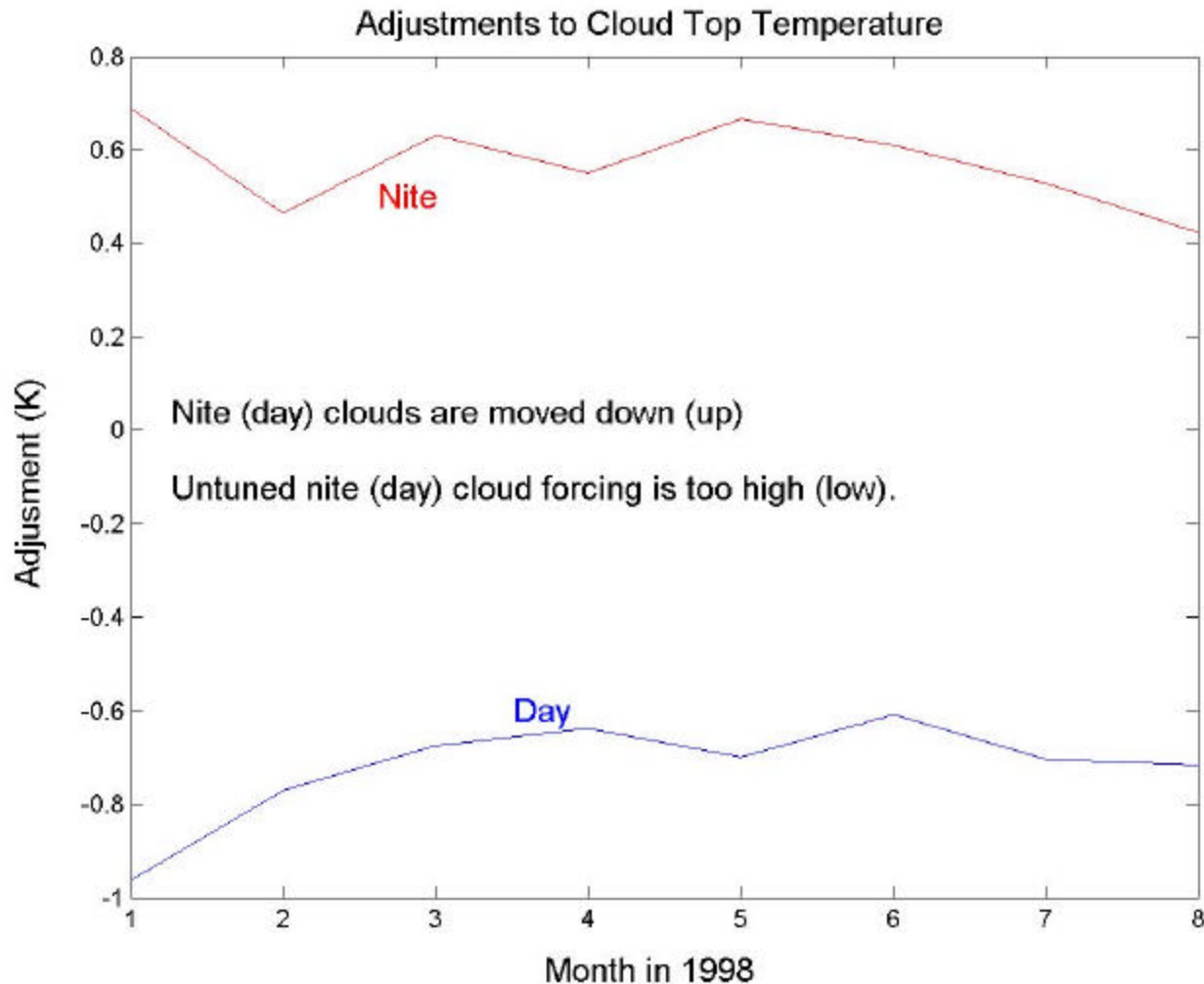
How can we make our look up table (LUT) for surface albedo, which jump starts the UNTUNED calculation, work better?



All-sky land SW requires much more tuning than does ocean.
 Is this all due to (1) previous glitch in lookup table and (2) a bug that
 Used 0.5, instead of 0.6, as the effective cosSZA for diffuse?

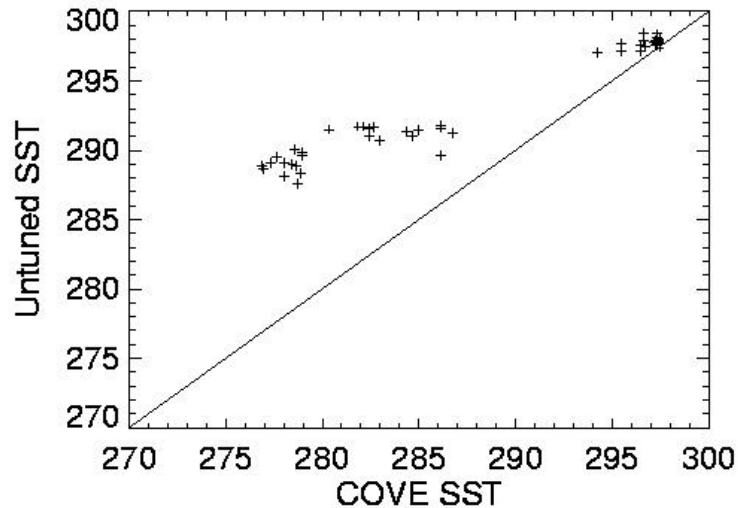


There is a problem with the day vs nite cloud height in TRMM.
What about (1) checking it out for Terra as below and (2) getting
a direct word from Cloud WG validation?

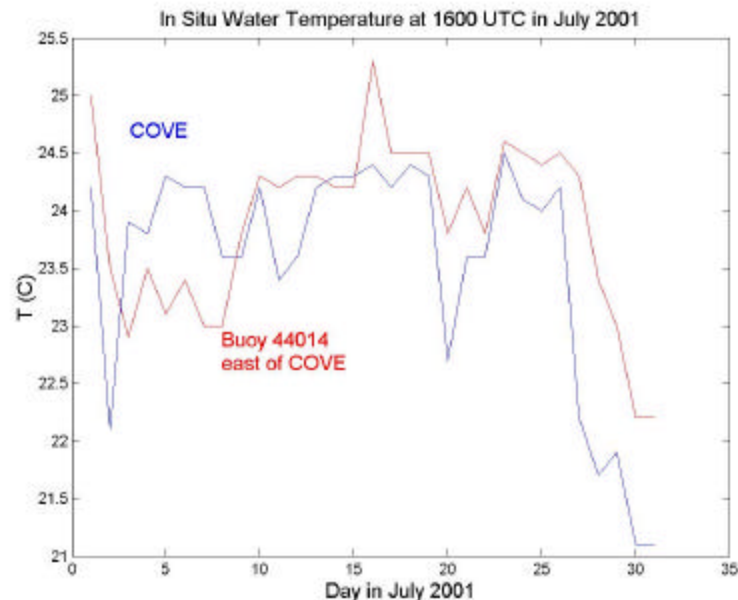
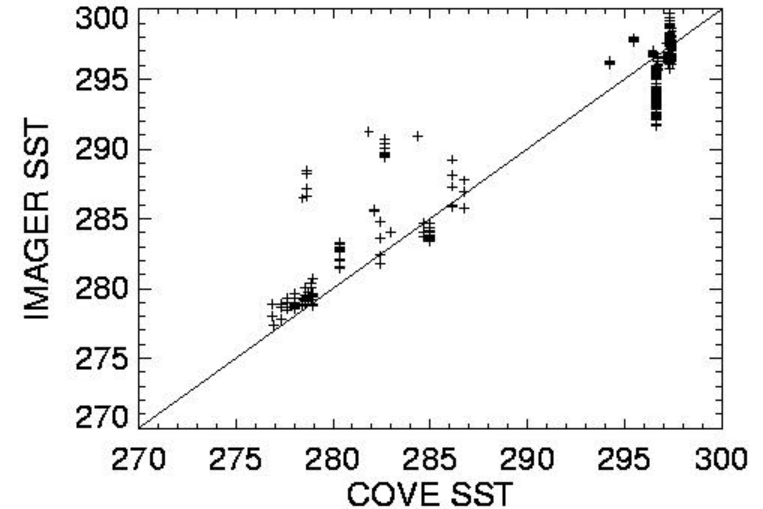


Terra Beta CRS run for Jan-Apr-Jul 2001

The NOAA/ECMWF SST
that we picked for SARB
Untuned SST Vs. COVE SST



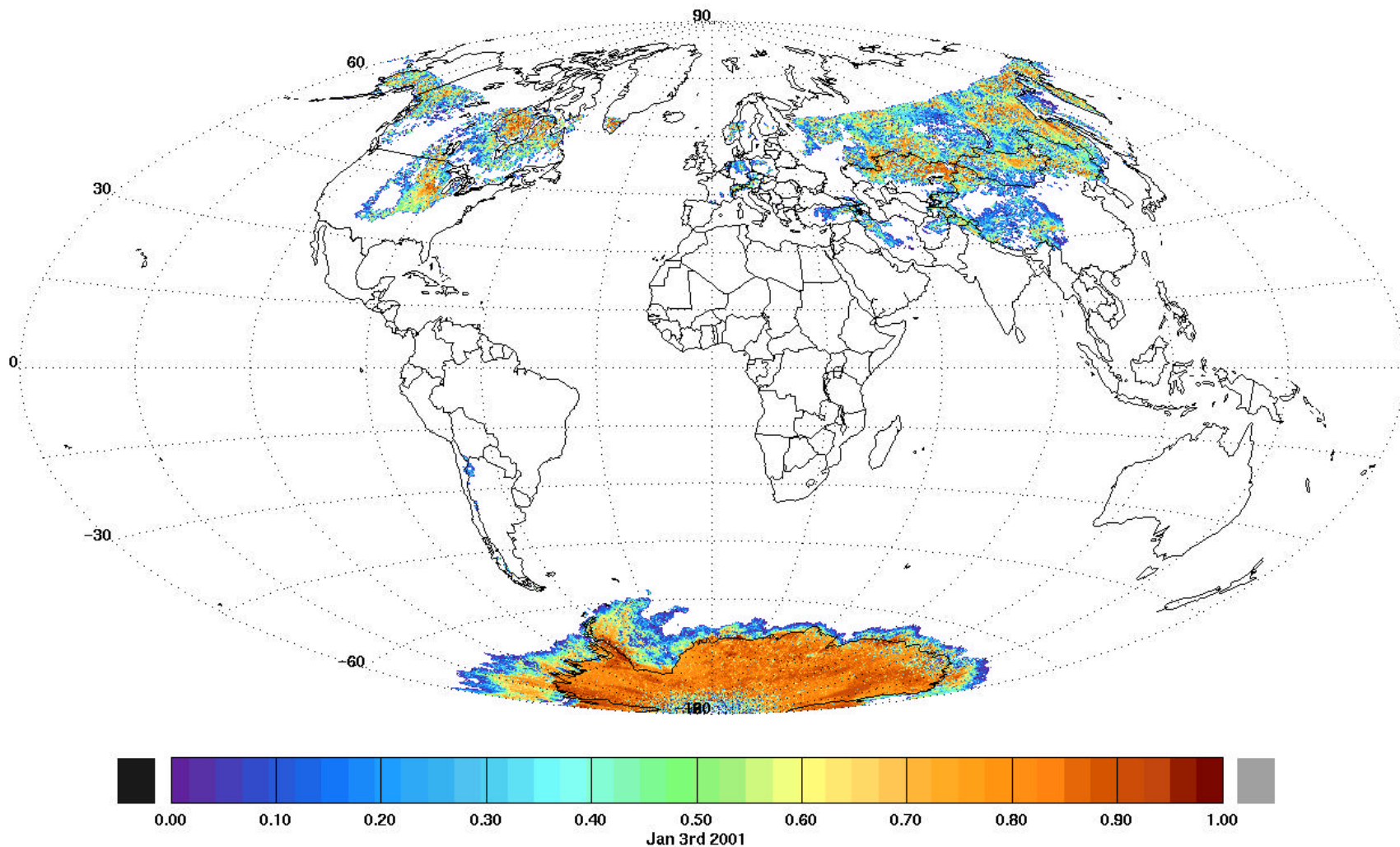
The Cloud WG SST
that we ignored
IMAGER SST Vs. COVE SST

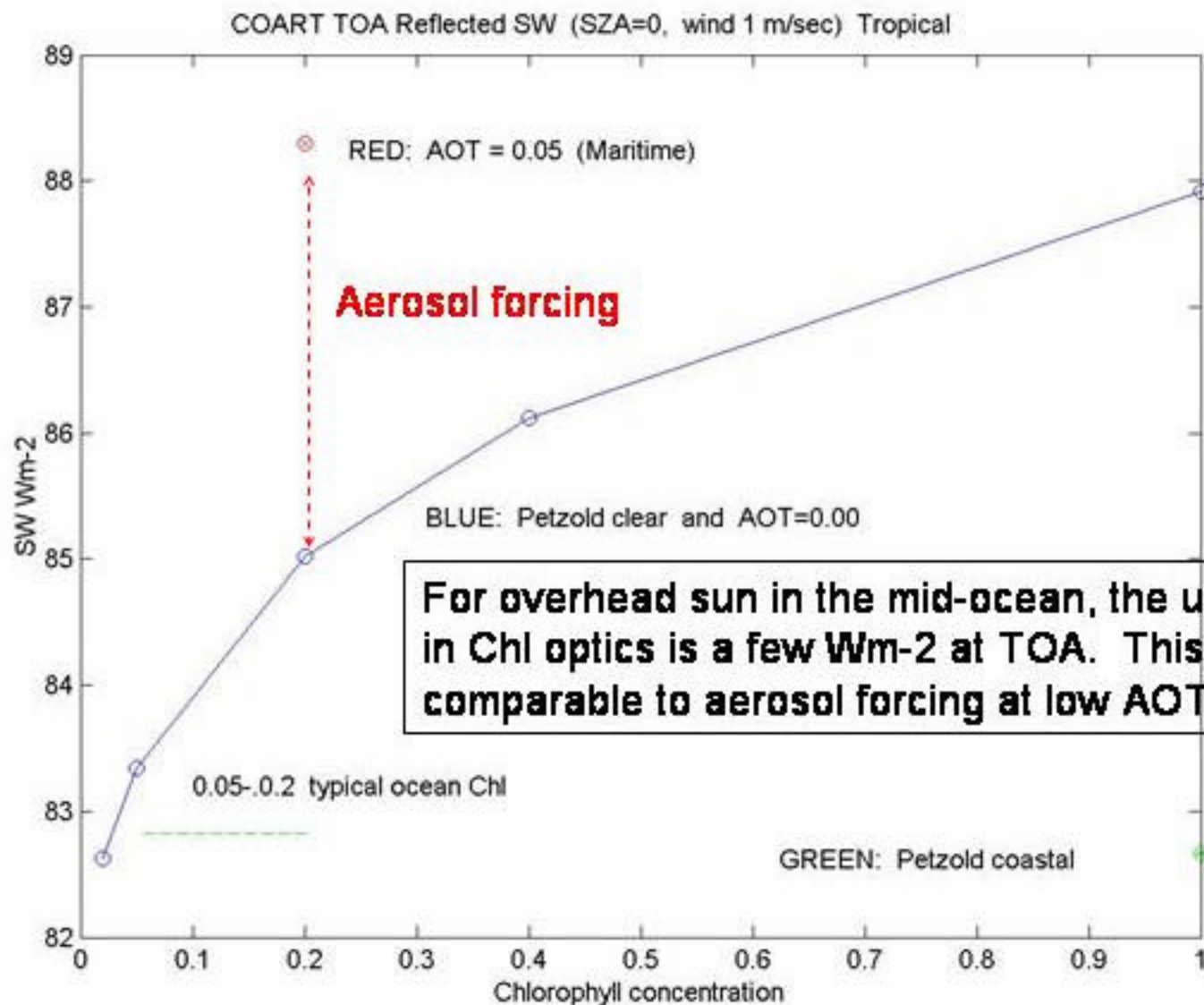


*Should we simply switch to using
Cloud WG SST in the fashion of
our present month by month
Interpolation of daily MODIS
AOT?*

And develop a similar interpolation of Cloud WG cryosphere albedo (1.6 micron Terra and 2.1 micron Aqua) to guide our selection of surface spectral albedo in cloudy sky?

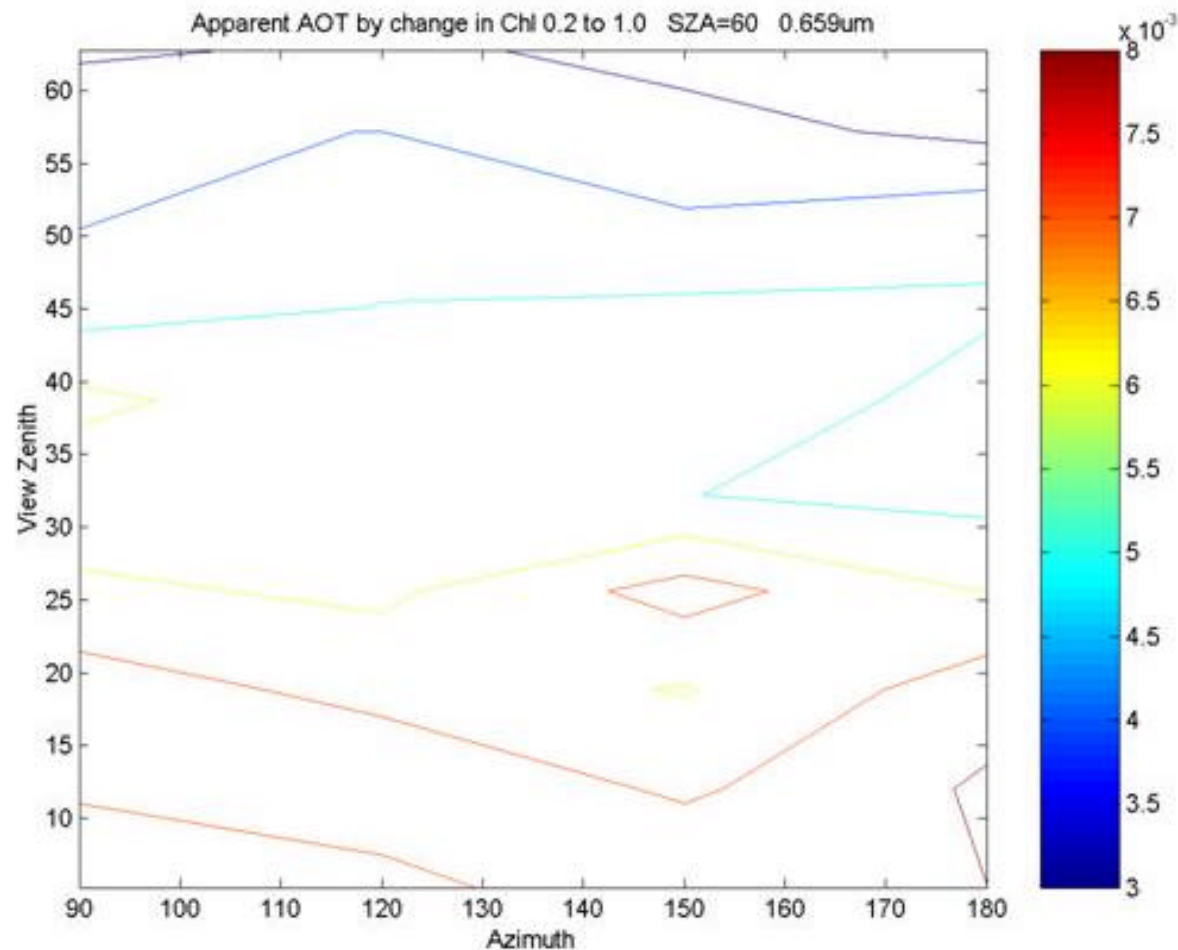
Untuned CRS Cryosphere Surface Albedo Jan 3 2001





For overhead sun in the mid-ocean, the uncertainty in Chl optics is a few Wm-2 at TOA. This is comparable to aerosol forcing at low AOT.

Chlorophyll concentration is not yet a gridded input. Fred's parameterization of Zhonghai's COART ocean spectral albedo is ready for it. Sasha has expressed interest in a CERES Chl map, too.



CERES Terra Beta CRS SW SARB over COVE (Jan, Apr, Jul 2001)

PAPS greatly enhanced coverage during CLAMS (July 2001).

Tuned in regular font.

Untuned in parentheses using italic font.

	Observed mean	N	Bias Obs-Sarb	RMS
ALL SKY	Wm-2		Wm-2	Wm-2
SW Down Sfc.	701	633	-8 (-8)	90 (84)
SW Up at TOA	209	633	-3 (7)	15 (32)

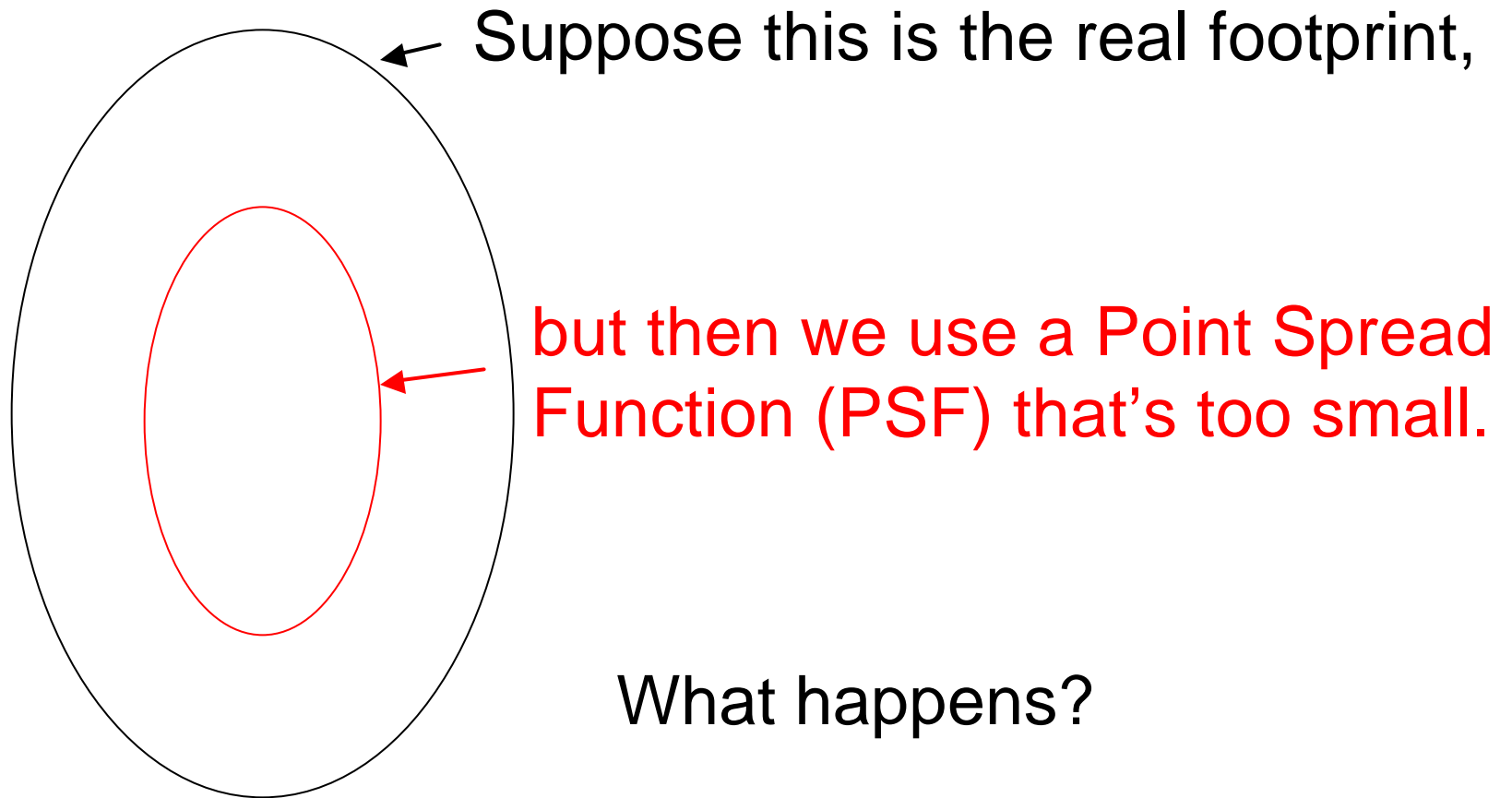
OVERCAST Sat. + Sfc.

SW Down Sfc.	281	109	-28 (17)	119 (104)
SW Up at TOA	533	109	4 (-40)	22 (52)

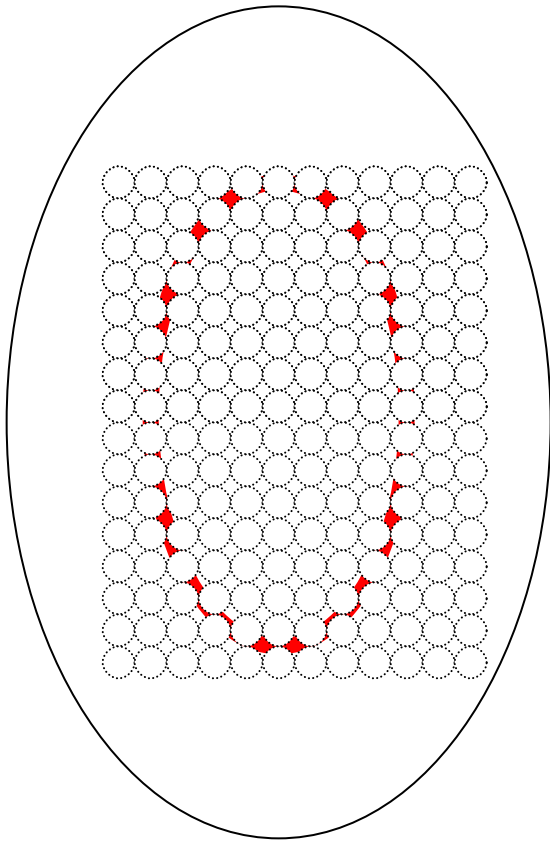
CLEAR Sat. + Sfc.

SW Down Sfc.	816	78	-13 (7)	22 (29)
SW Up at TOA	73	78	-11 (-21)	15 (27)

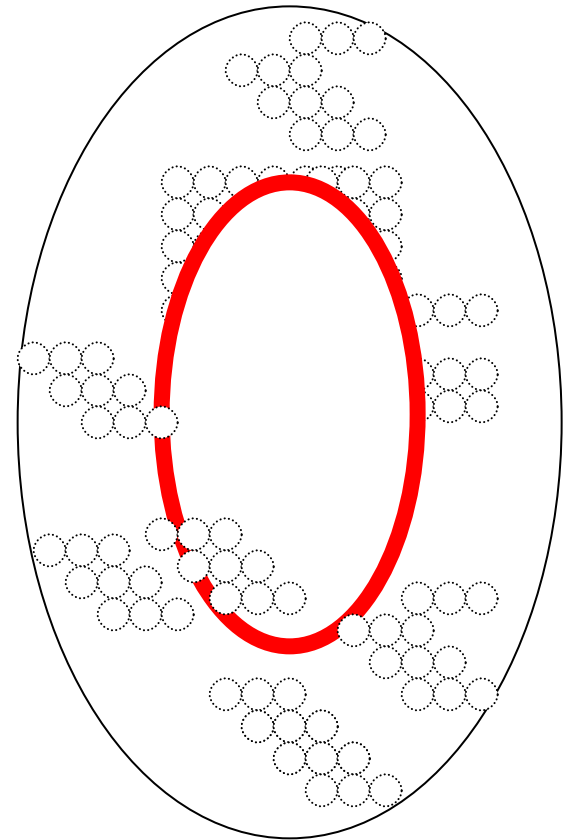
Why such odd results for overcast?
(Wish we had Su's ULDB to answer)



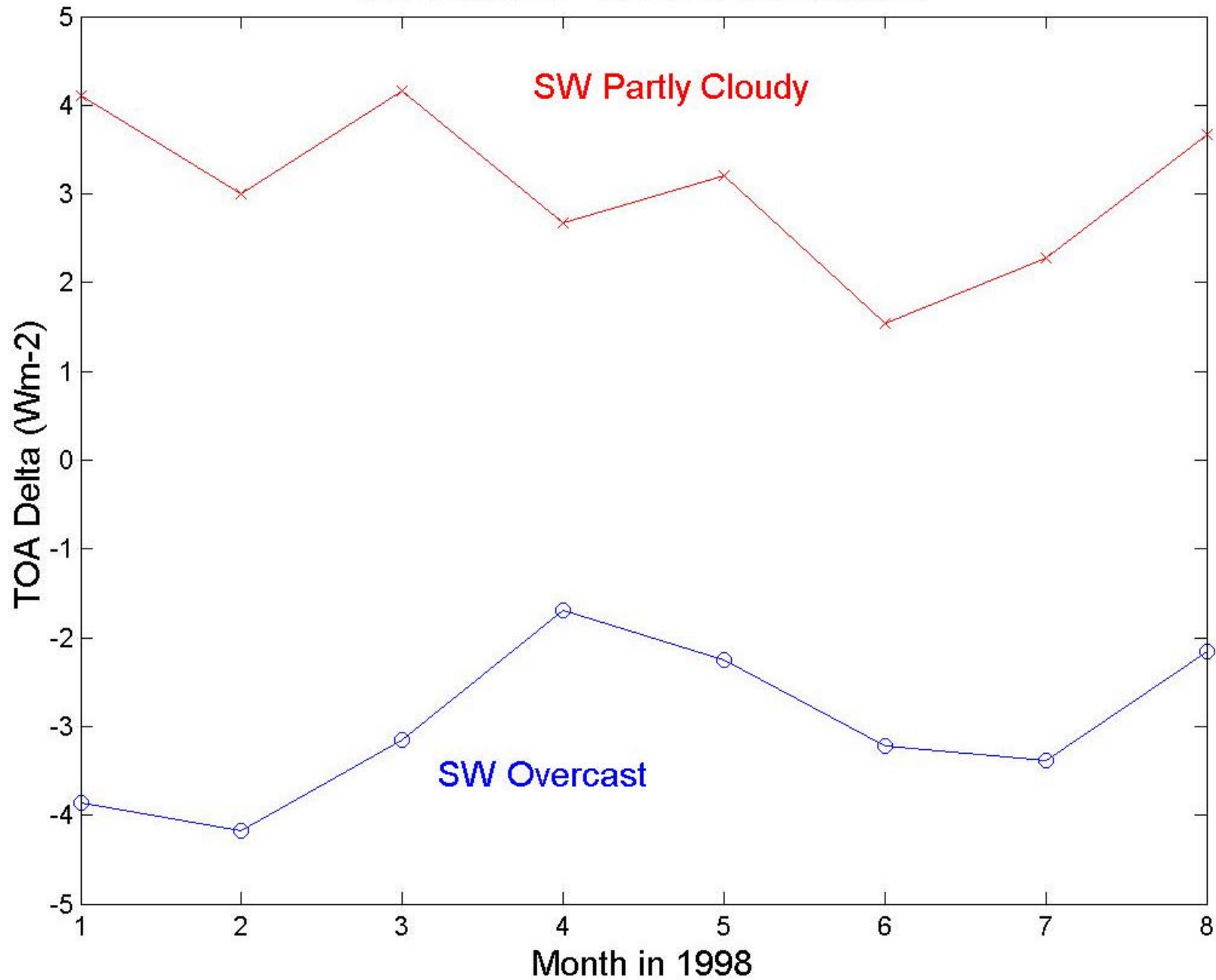
By assuming a PSF that's too small (the red oval), we would label the footprint as overcast when it's really partly cloudy.



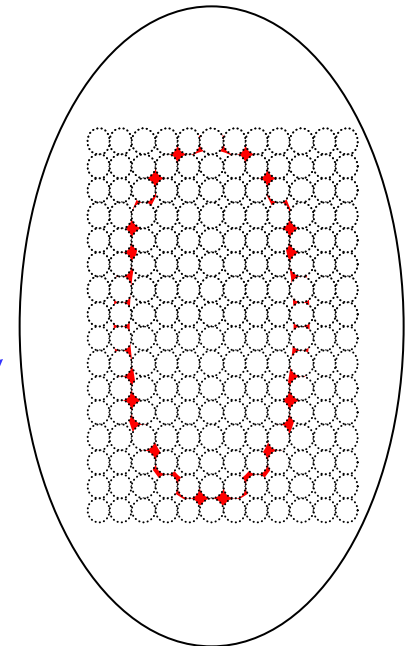
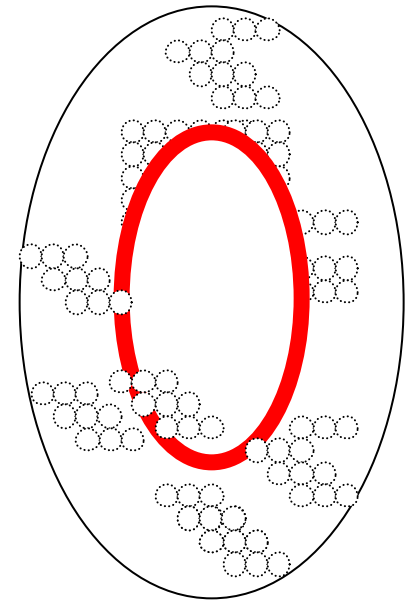
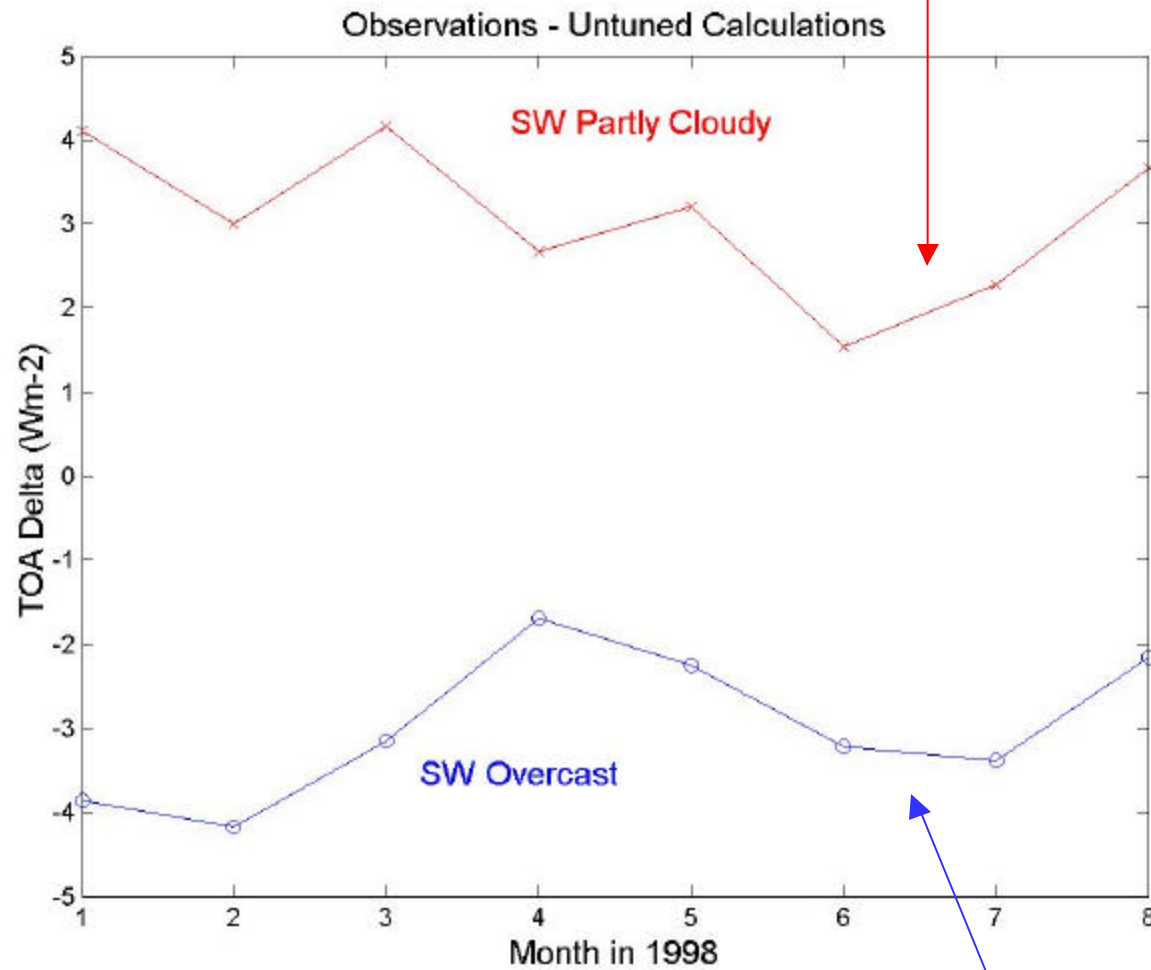
And because the clouds are random, we would greatly underestimate cloud fraction in some partly cloud cases.



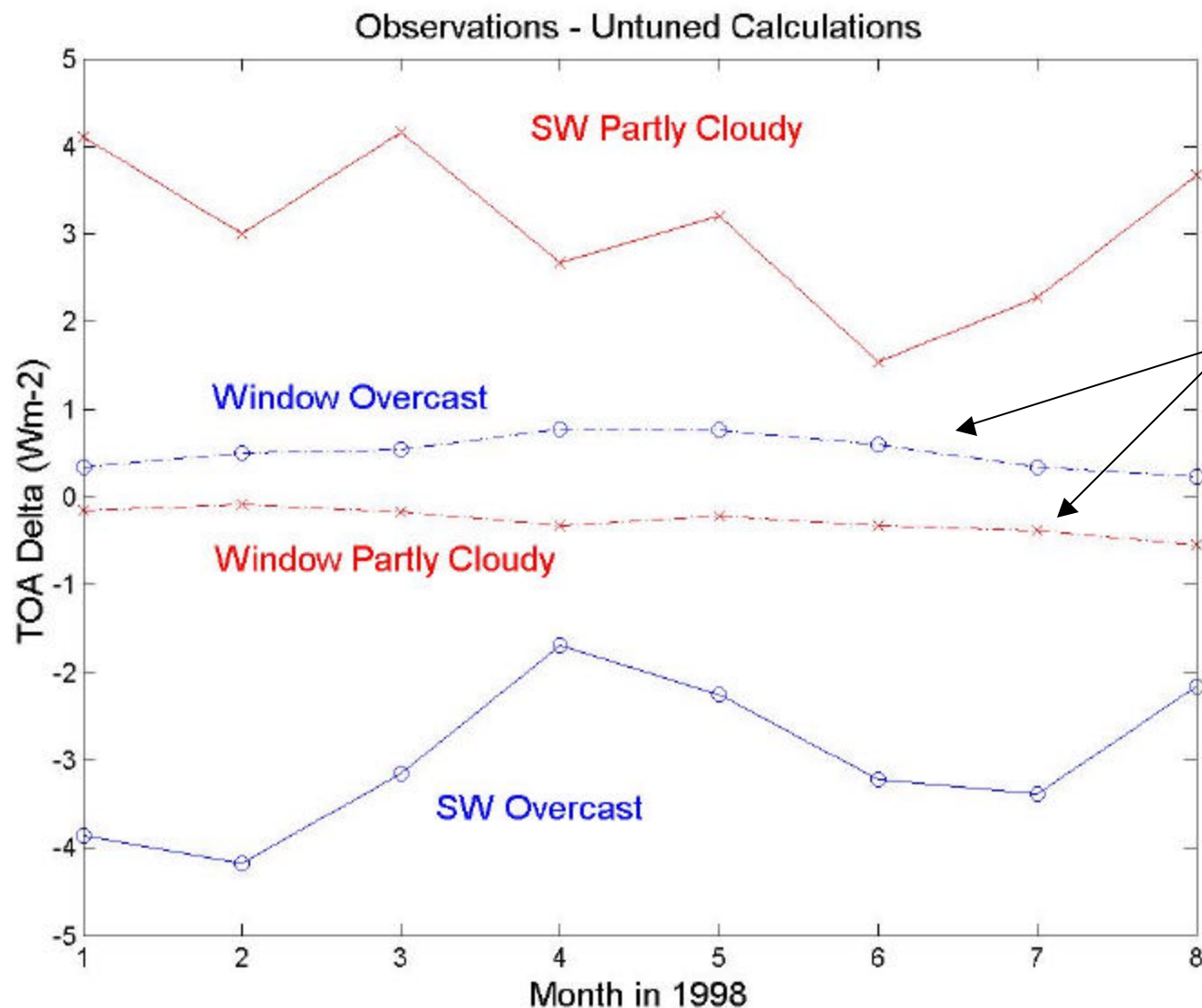
Observations - Untuned Calculations



Computed cloud forcing
is too small



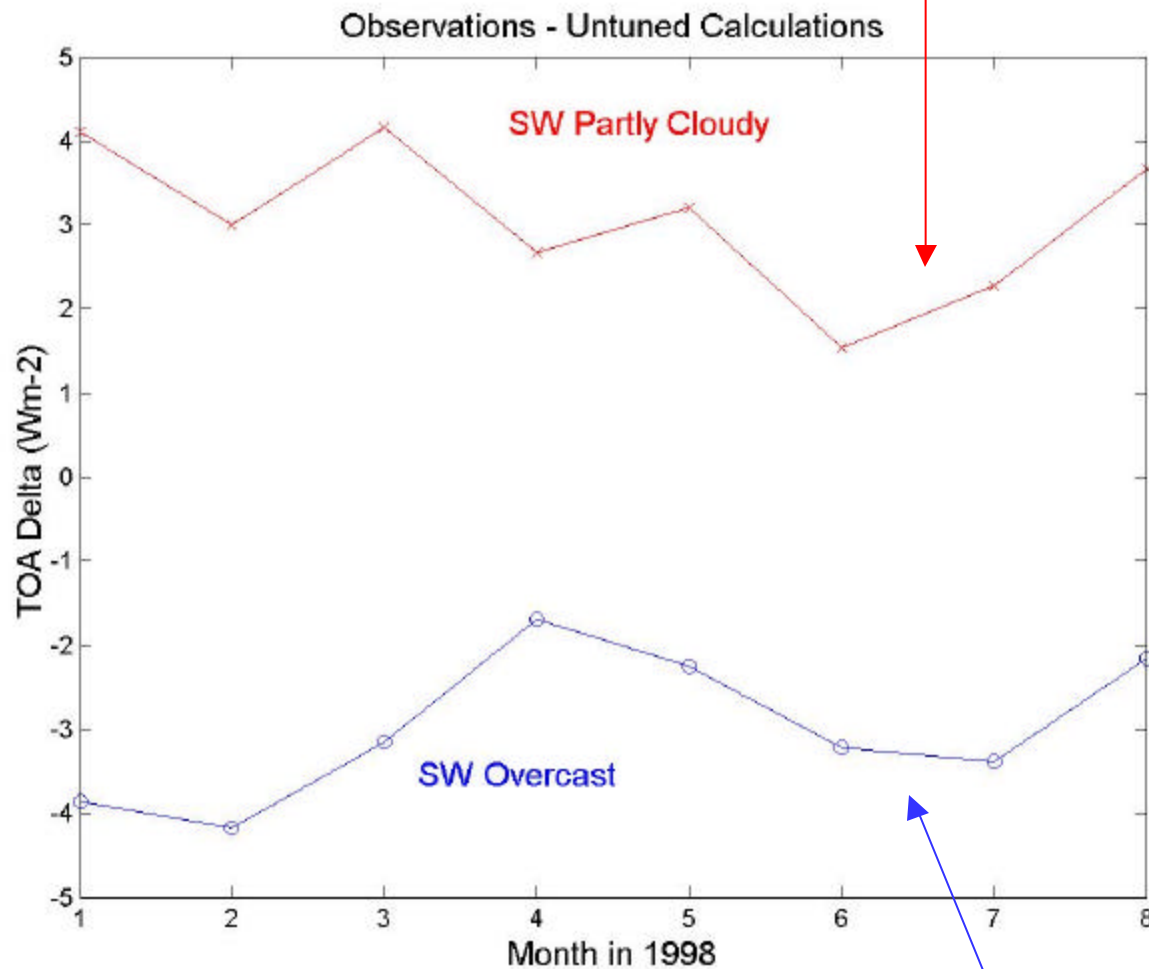
Computed cloud forcing
is too large



Cloud forcing
In SW and LW
have opposite
signs, so
window signal
here may be
consistent.

Signal seen
for broadband
LW radiance,
but not for
OLR (flux)

Computed cloud forcing
is too small



What else can do this?

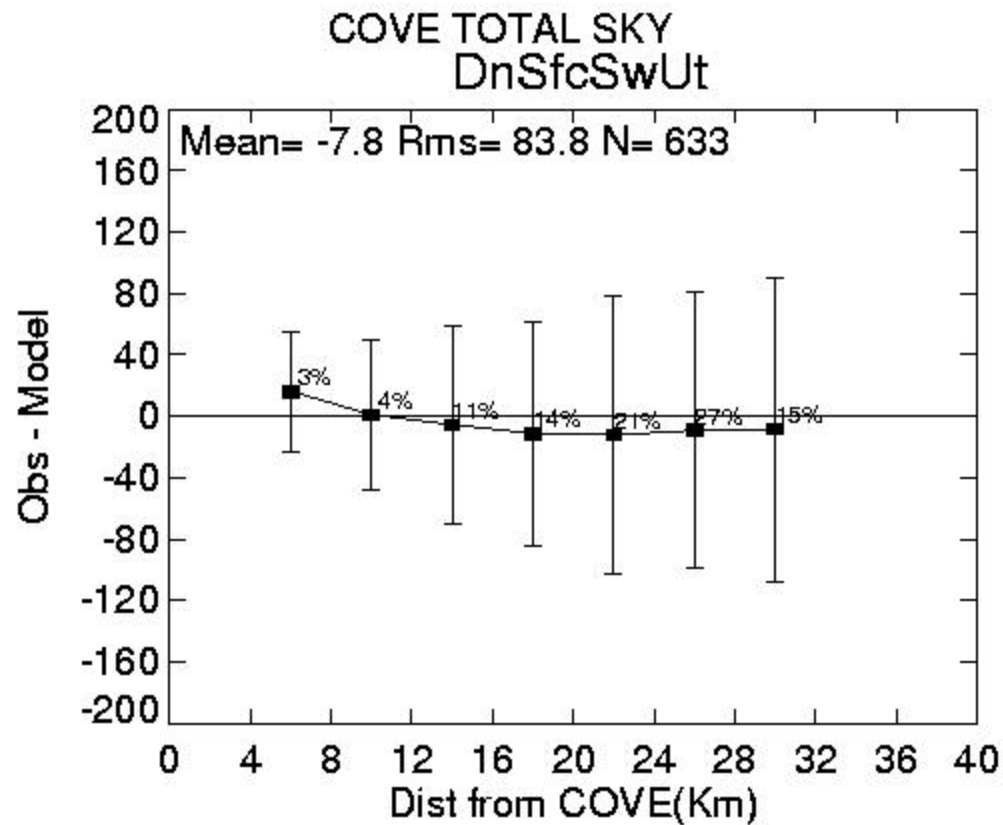
Possibilities include:

3-D effects in ADM
but not in 2 stream

“Gamma distribution”
effect [i.e., need pdf
of tau, not just $\ln(\tau)$]

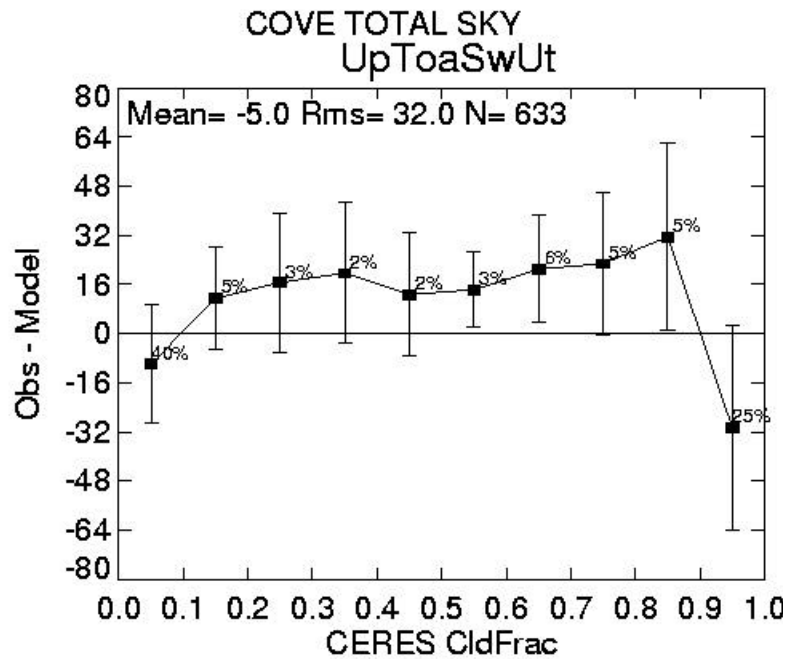
Computed cloud forcing
is too large

Bias in Untuned Surface Insolation COVE Jan-Apr-Jul 2001 (Terra Beta)

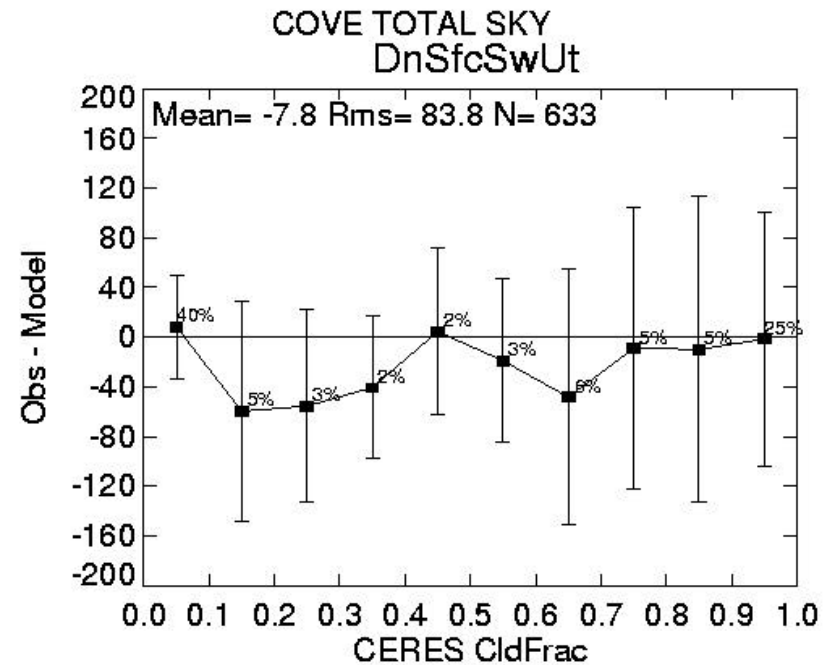


Untuned biases

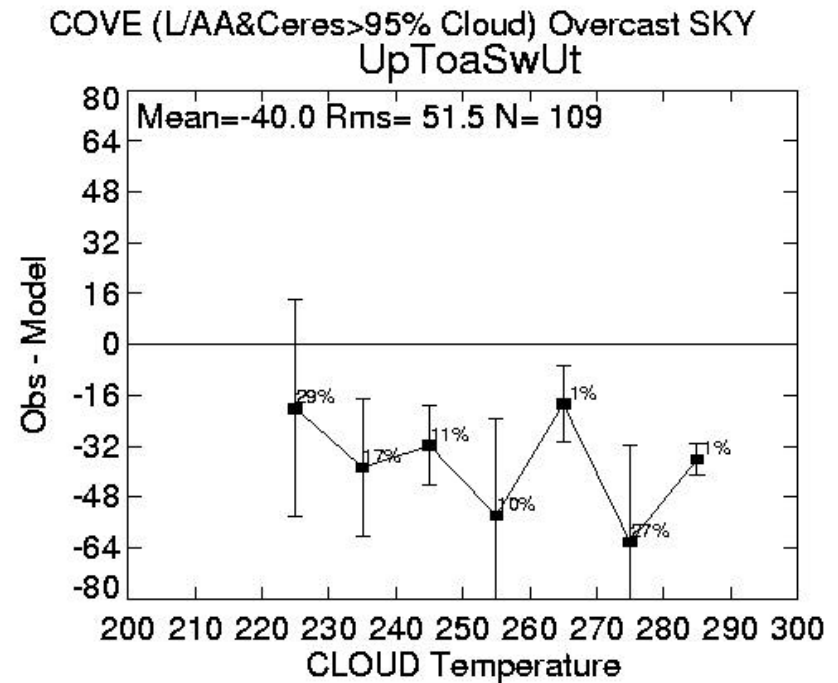
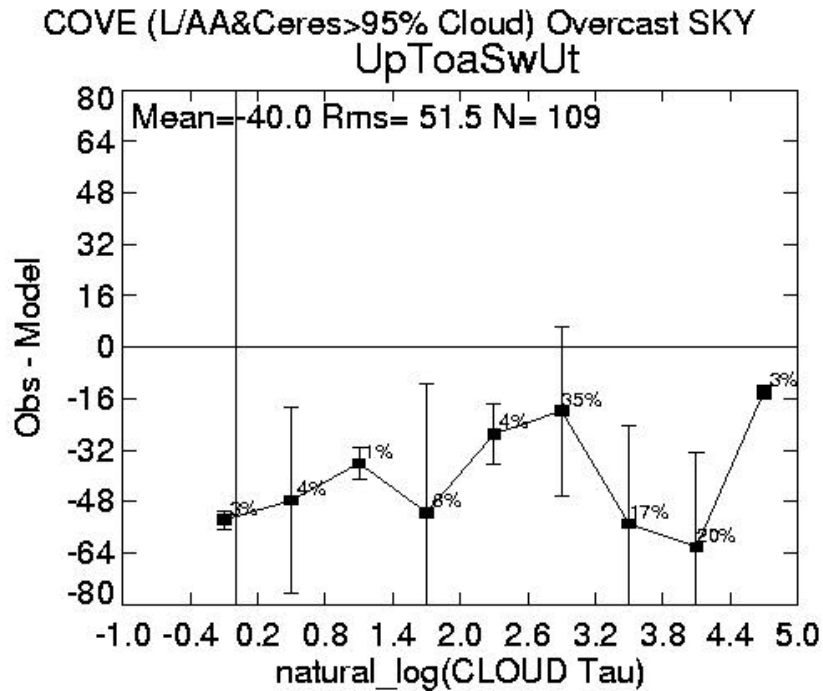
TOA SW Up



Surface Insolation



For doubly screened overcast, the bias in upward SW to TOA runs across tau and cloud height



For doubly screened overcast, the bias in surface insolation is strong but not entirely consistent with tau and cloud height.

